Reef Status and Fisheries of Navassa Island

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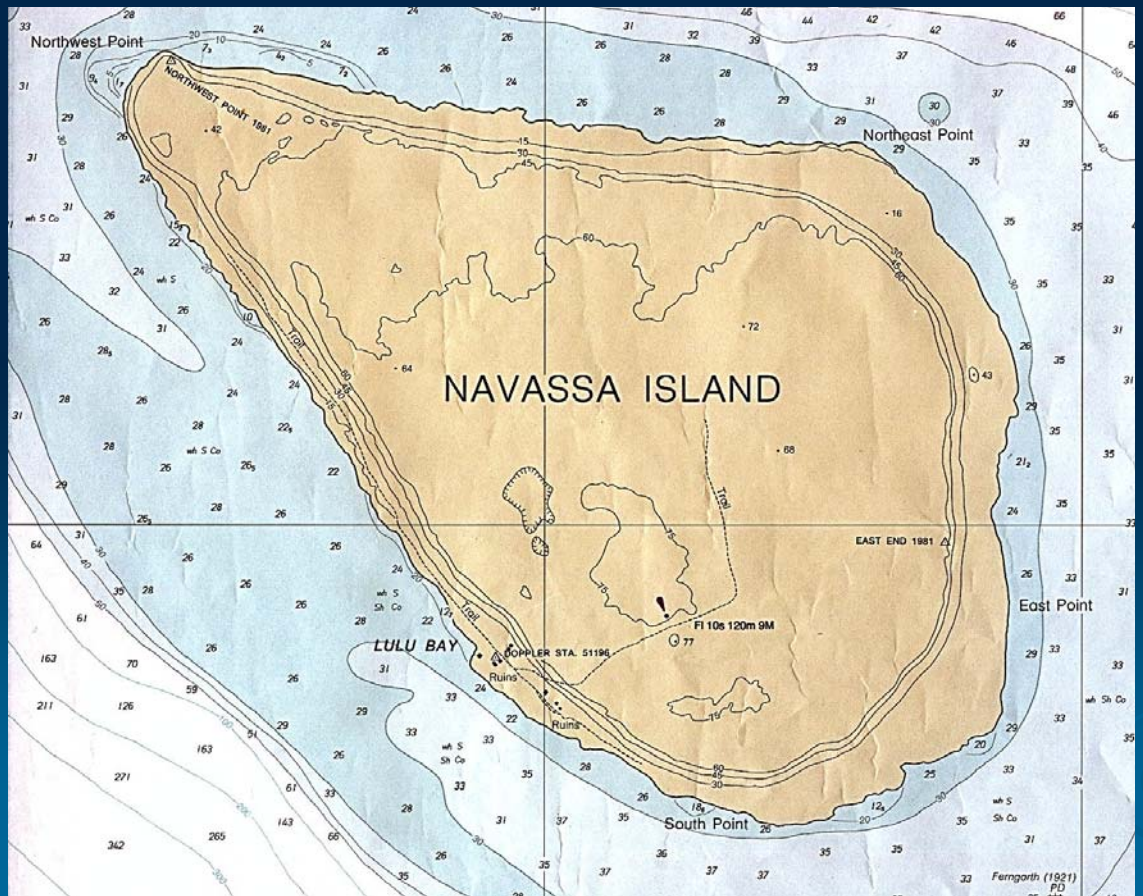
Acknowledgements

- Captain/Crew of the R/V Coral Reef II
- US Fish and Wildlife Service- Caribbean Islands National Wildlife Refuge

Navassa Island

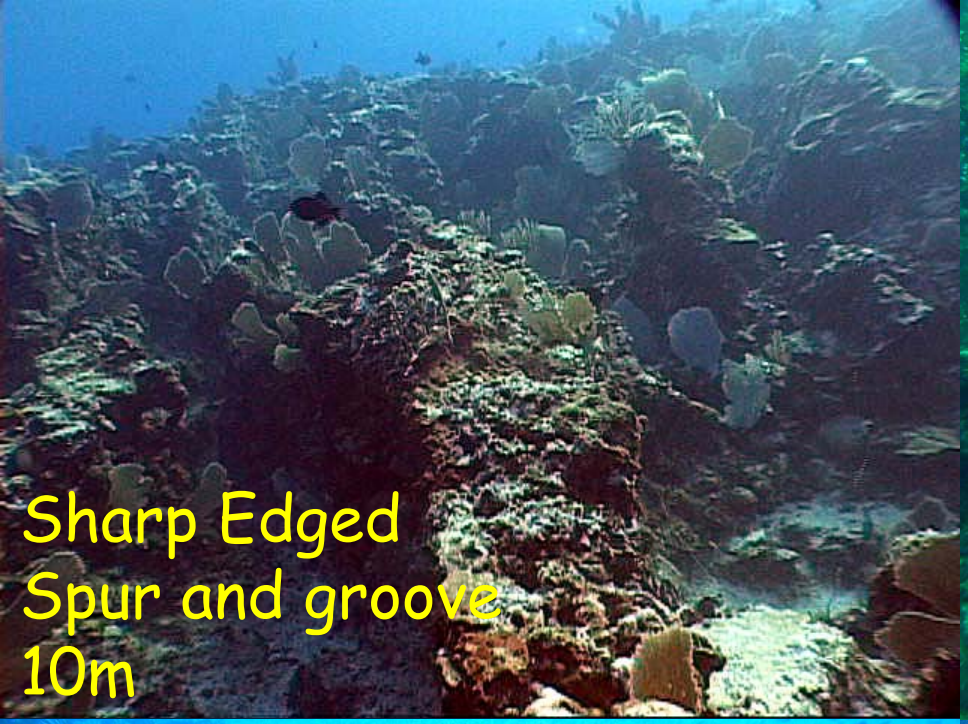
- Part of Caribbean Islands National Wildlife Refuge under jurisdiction of US Fish and Wildlife Service (USFWS)
- Currently uninhabited,
- 5 km^2
- Peculiar topography

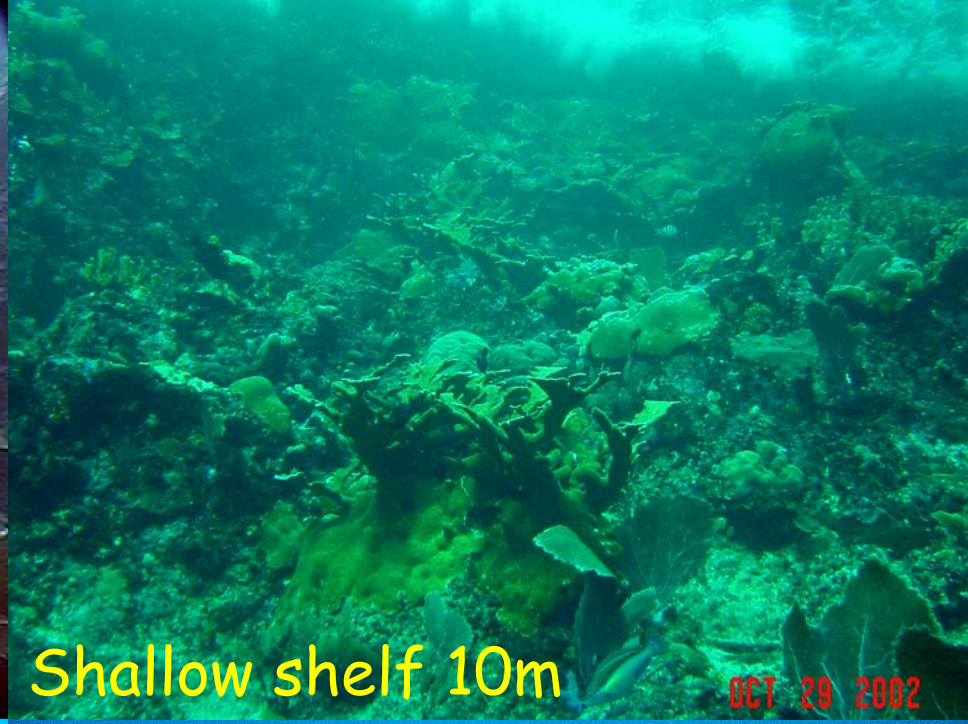

CUBA
20°N
HAITI
Dominican Republic
Greater Antilles
JAMAICA


Northwest Point
NORTHWEST POINT 1981
Northeast Point
NAVASSA ISLAND
EAST END 1981
East Point
Fl 10s 120m 9M
LULU BAY
DOPPLER STA. 51196
Ruins
Ruins
South Point
Ferngorth (1921)

Nov 2002 Cruise

- Total Dives: 314
- Total Hours underwater: 266
- Total still photographs taken: ~ 4000
- Benthic characterization: 19 sites
- Coral size measurements: 6000 colonies
- Fish Counts: 110 diver plot counts; 17 video time-lapse camera-days (@ 8 hrs); 37 plot counts for fish biomass
- Interviews with Haitian fishers: 3


Sharp Edged
Spur and groove
10m

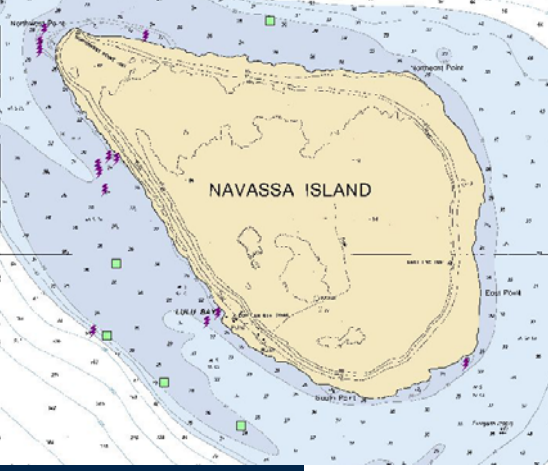

Shallow shelf 10m
OCT 29 2002


Deep patch reef
20-25m
2 10:57 AM

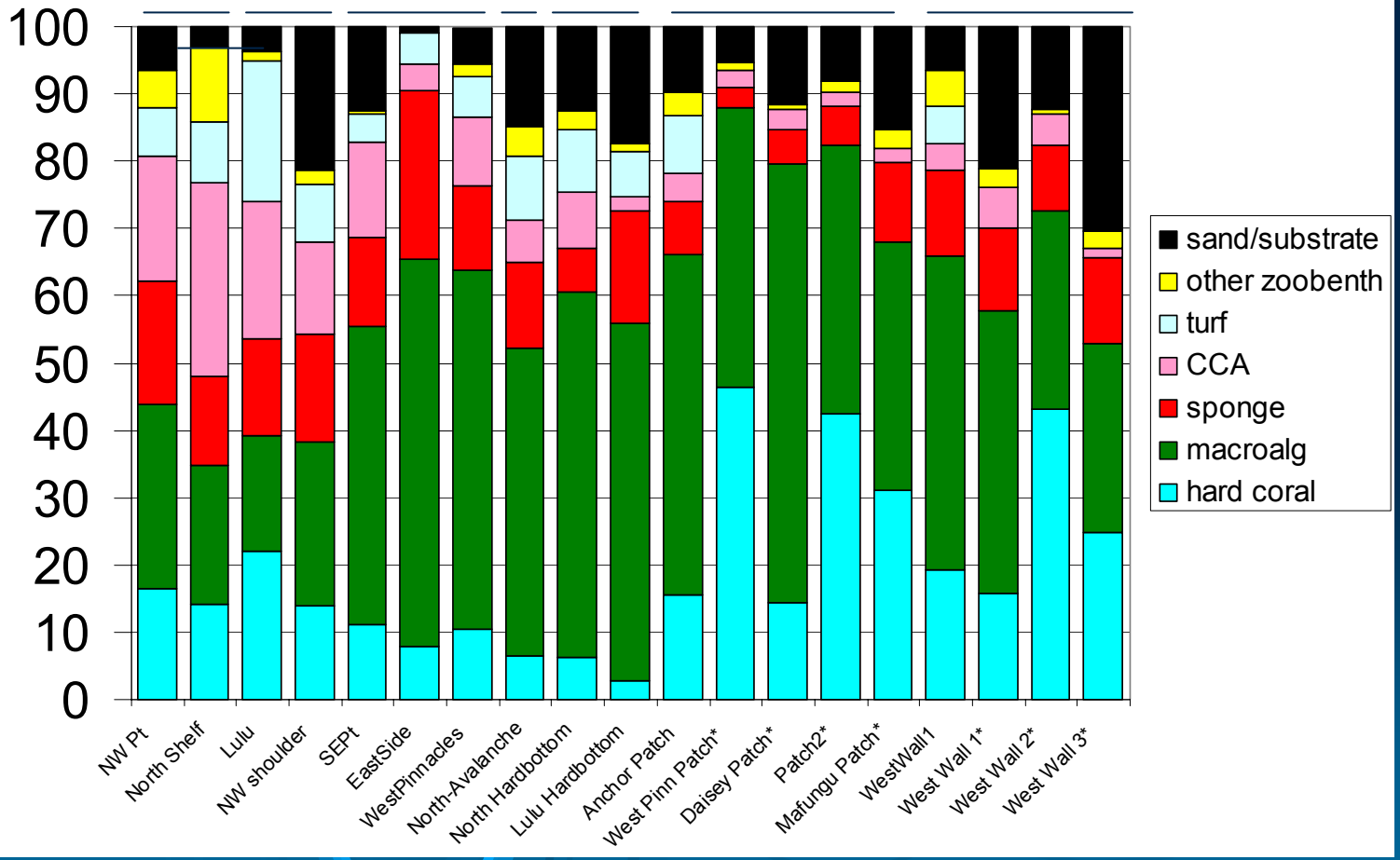

"Calves"
15-20m
OCT 31 2002

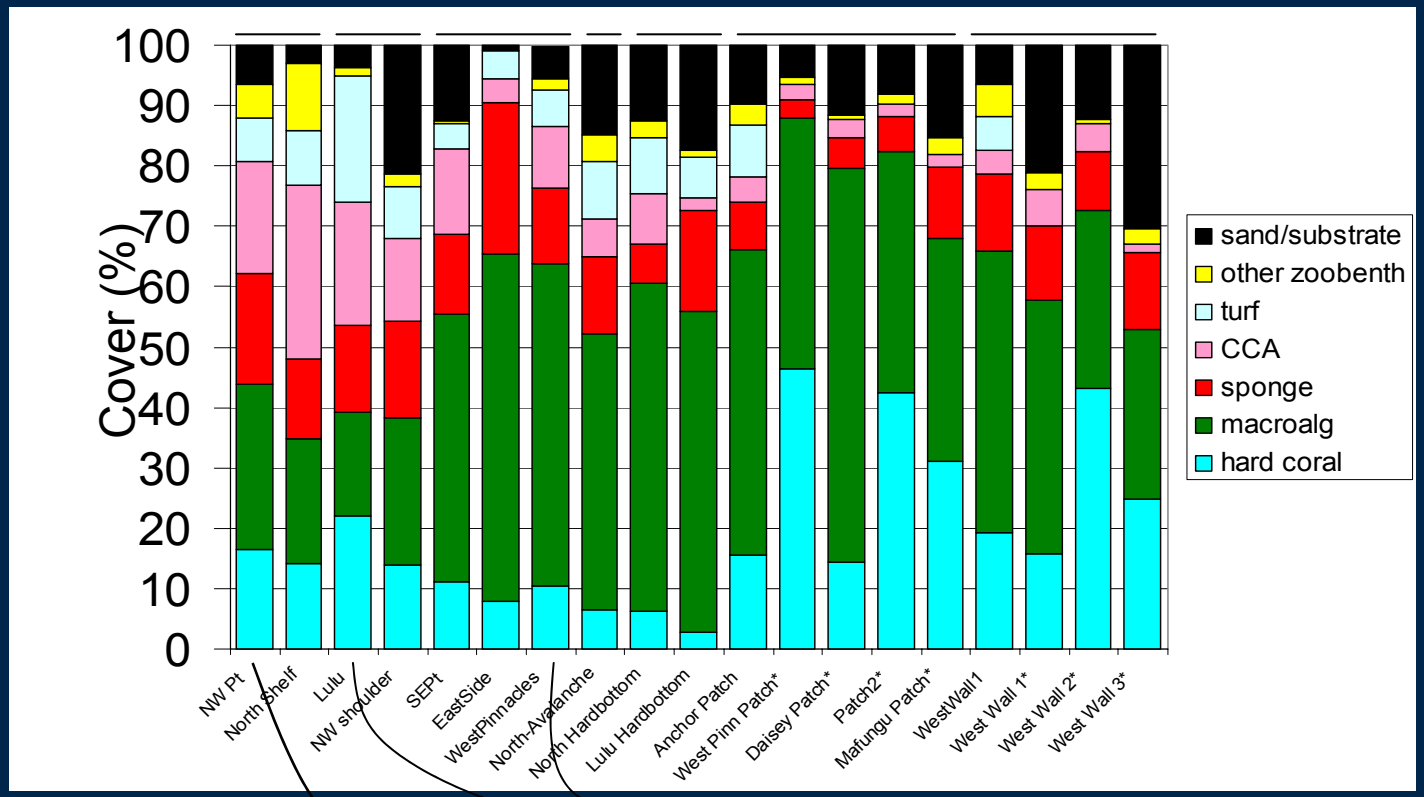
Benthic communities

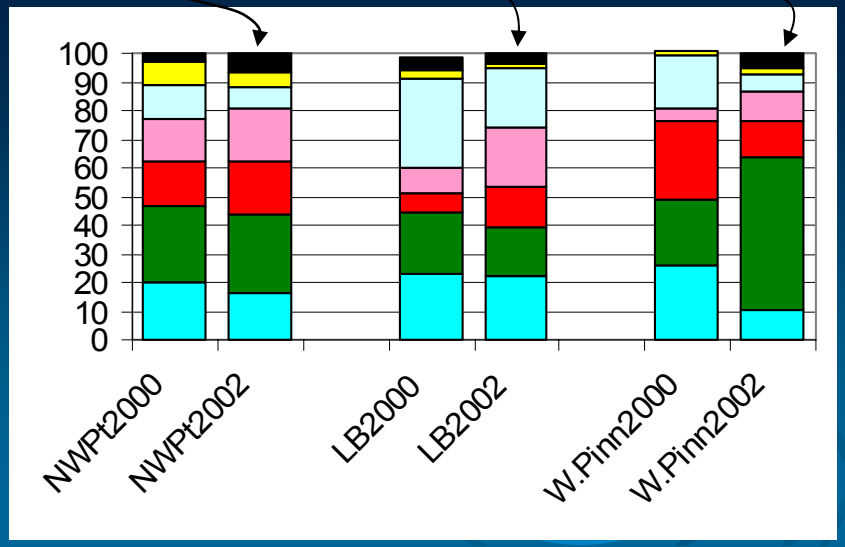
- Quantitative community description
  - In situ line-intercept transects OR photo quadrats in deeper sites
  - Coral conditions – predation, disease, etc.
  - Coral size structure – additional haphazard sampling
  - Additional targeted sampling of
    - Gorgonians (species, density, size) – Yoshioka
    - Crustose Coralline Algae – Steneck and Begin



Sharp-Edge Spur&Groove
Shallow Shelf (10-15m)
"Calves" (20m)
"Avalanche" (15m)
Deep Hardbottom (25m)
Deep Patch Reefs (25m)
Deep Slope (25-30m)

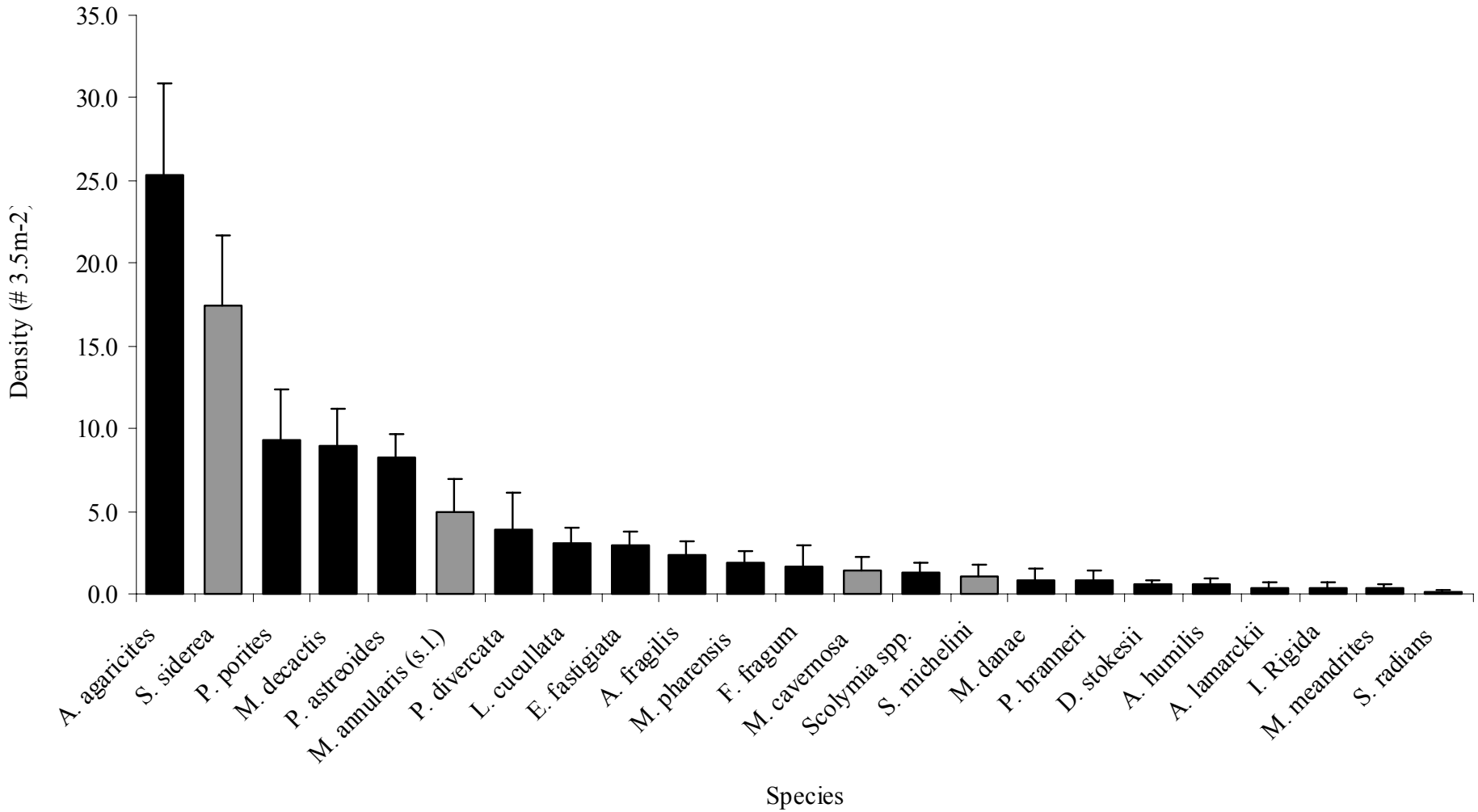



Cover (%)
100
90
80
70
60
50
40
30
20
10
0
sand/substrate
other zoobenth
turf
CCA
sponge
macroalg
hard coral
NW Pt
North Shelf
Lulu
NW shoulder
SEPt
EastSide
WestPinnacles
North-Avalanche
North Hardbottom
Lulu Hardbottom
Anchor Patch
West Pinn Patch*
Daisey Patch*
Patch2*
Mafungu Patch*
WestWall1
West Wall 1*
West Wall 2*
West Wall 3*


100
90
80
70
60
50
40
30
20
10
0
NWPt2000
NWPt2002
LB2000
LB2002
W.Pinn2000
W.Pinn2002

SITE	Habitat Type	# colonies surveyed	% with snails	% with other predation	% algal	% sponge	% coral	% disease	% with bleaching/ discoloration
NW Pt	SESG	185	0.5	1.6	5.4	1.6	0	0	2.2
North shelf	SESG	201	2.5	0	10.4	5.0	2.0	0	1.5
Lulu Bay	Shallow shelf	177	5.6	0	6.8	4.5	2.8	0	1.7
East Side	Calves	69	4.3	2.9	27.5	8.7	1.4	0	1.4
SE	Calves	179	2.8	0.6	7.8	4.5	2.2	0	1.7
West side	Calves	174	4.0	0	14.9	4.6	0	0	4.0
TOT/ MEAN		985	3.28	0.85	12.1	4.82	1.4	0	2.08

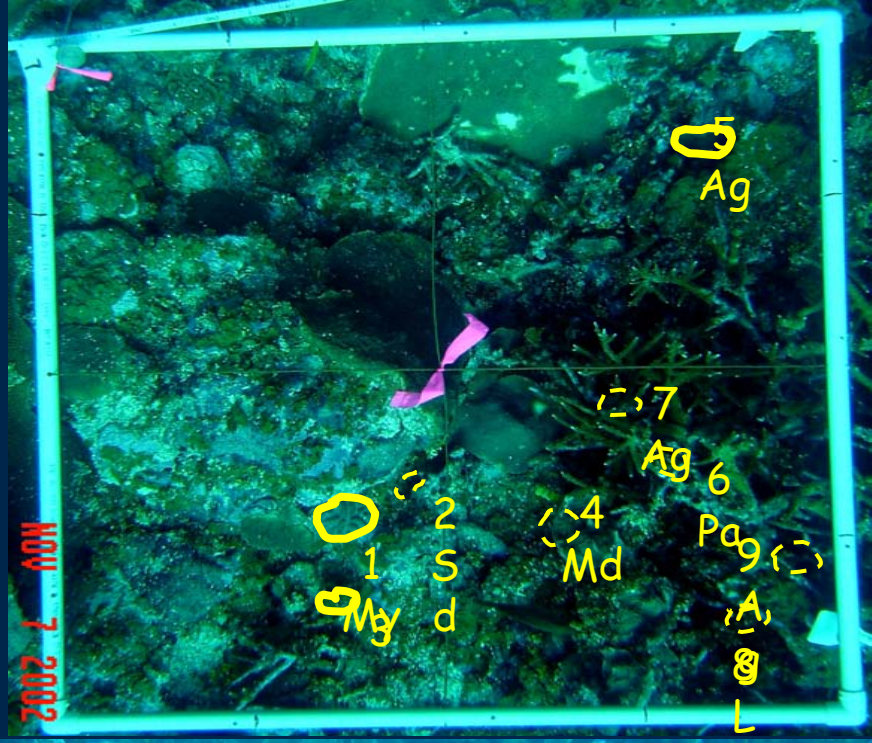
Williams

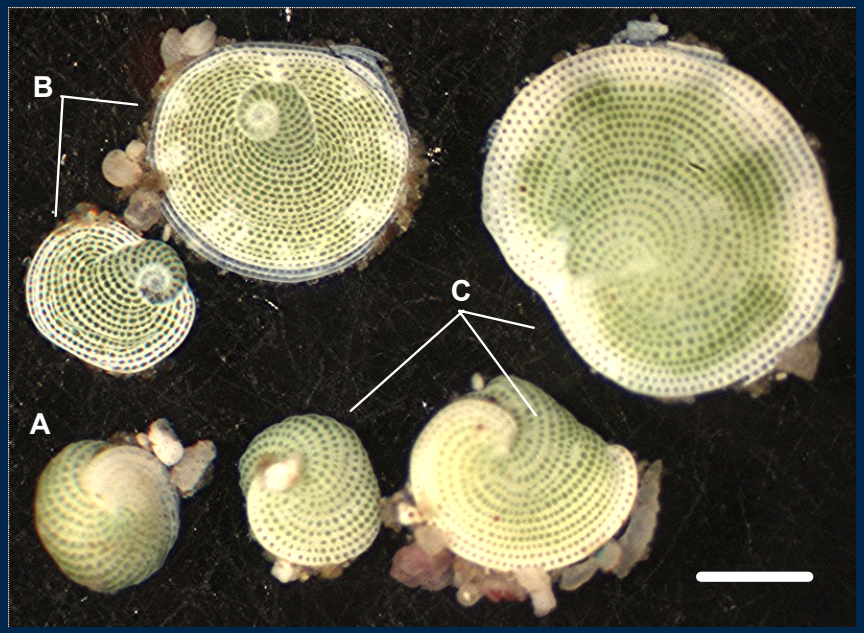

35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Density (# 3.5m-2)
A. agaricites
S. siderea
P. porites
M. decactis
P. astreoides
M. annularis (s.l.)
P. divercata
L. cucullata
E. fastigiata
A. fragilis
M. pharensis
F. fragum
M. cavernosa
Scolymia spp.
S. michelini
M. danae
P. branneri
D. stokesii
A. humilis
A. lamarckii
I. Rigida
M. meandrites
S. radians
Species

Vermeij

Installations

- Permanent quadrats installed for long term assessment of coral recruitment and mortality
- Settlement plates to examine coral and CCA colonization (R. Steneck)
  - Caribbean-wide study



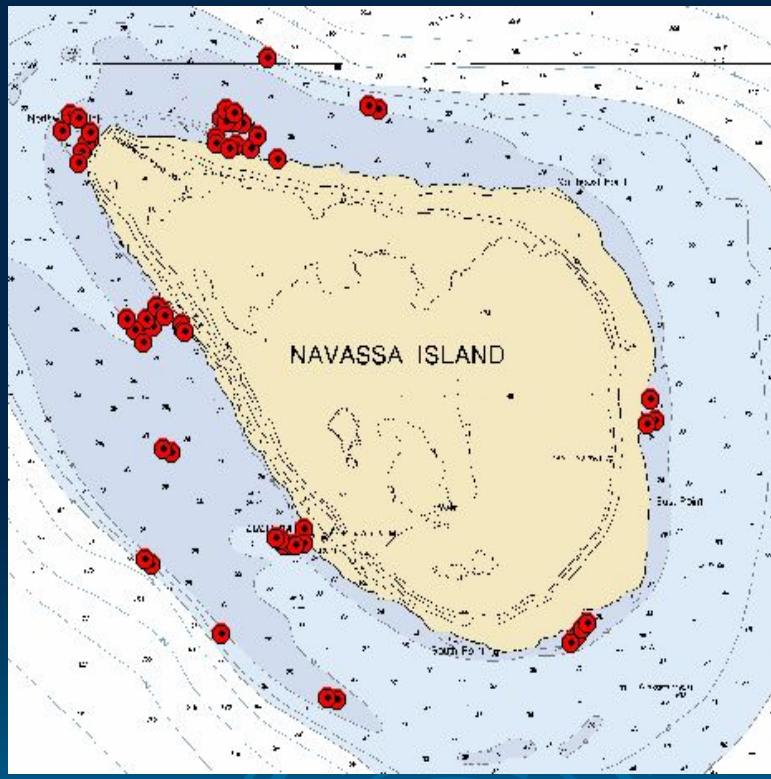


Members of several benthic groups (e.g., forams, crustose coralline algae, Acropora palmata) showed extended depth range at Navassa

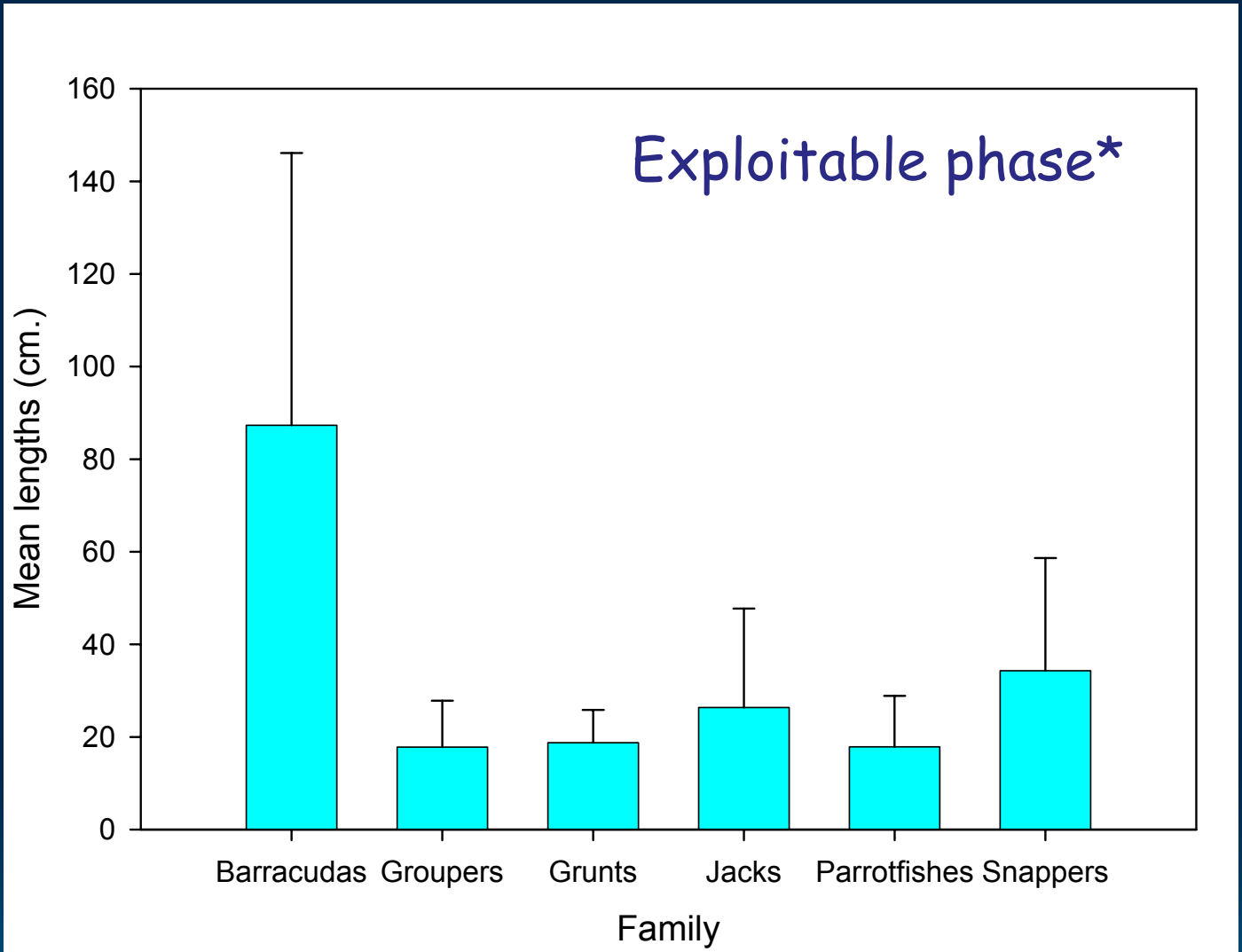
Overall, 35 new species added to cumulative observations for Navassa (Collette et al 2003) due to more "face time" in range of deeper habitats

RVC samples

- 20,901 fish counted
  - 71% of which were planktivores
    - blue chromis, creole wrasse, bluehead wrasse, bicolor damselfish
    - (44% in SE Florida)
  - Biomass dominated by piscivores (i.e. barracuda) though only 3.5% of abundance
    - Overall average 58 g m^{-2} (compared to 72 for SE Florida)
  - Only 12 individuals of large grouper species and 109 commercial snapper (primarily schoolmaster) observed
  - Grunts largely absent – habitat limitation



McClellan & Miller 2003



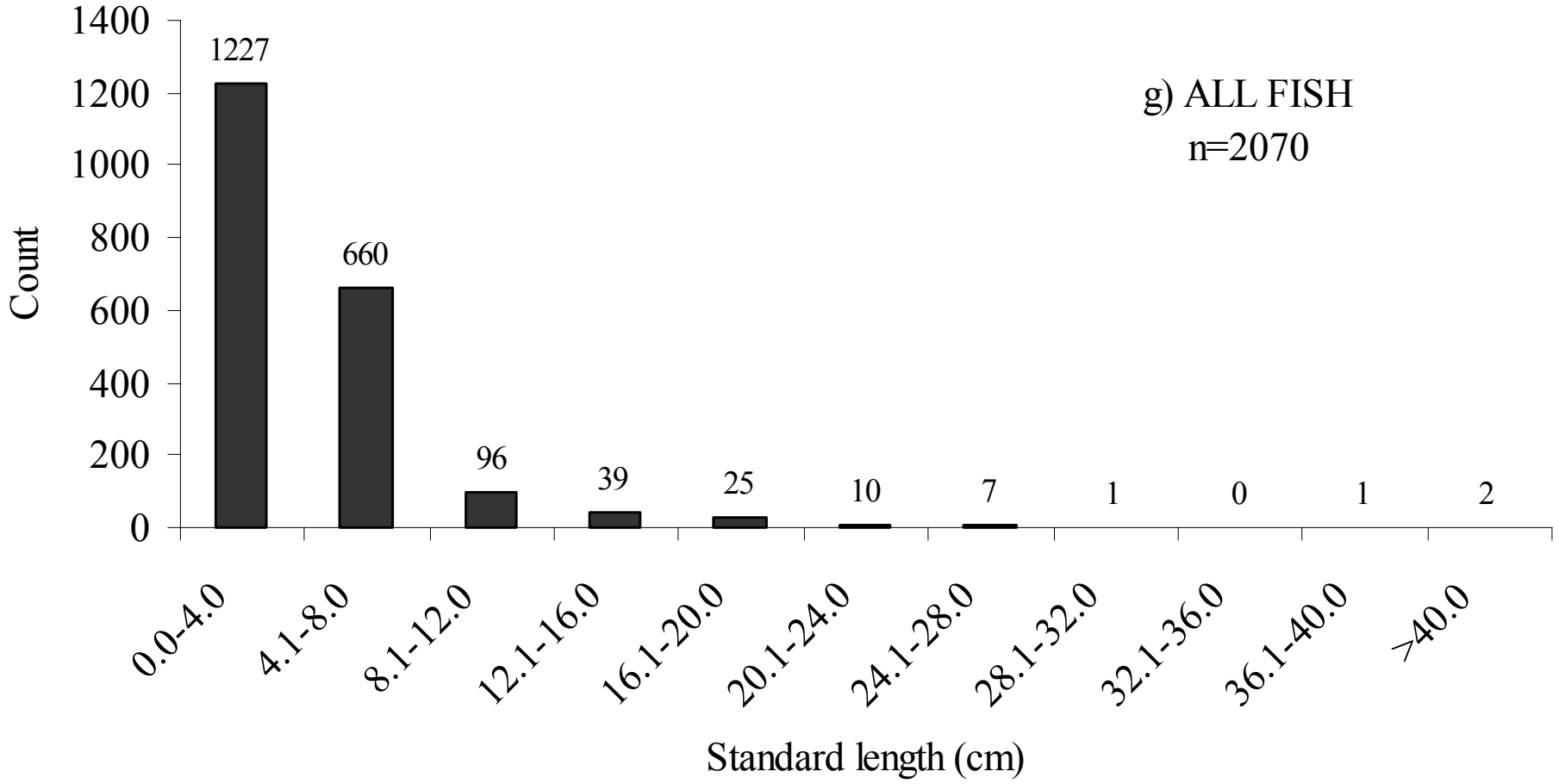
*excluding individuals <12 cm deemed too small for capture with observed fishing gear

McClellan & Miller 2003

Weighted plot census

- 2653 fish counted
  - 31% 'transient' (counted 3 times; 1/3 of biomass added)
- Overall density: 5.6 + 0.4 fish m^{-2}
- Overall biomass: 49.3 + 4.6 g m-2
  - Comparable counts in Neth Ant: 114 - 185
- Planktivores dominated both numbers (71%) and biomass (36%)
- Only 21 fish over 20cm SL

Sandin 2003


g) ALL FISH
n=2070
Count
1400
1200
1000
800
600
400
200
0
1227
660
96
39
25
10
7
1
0
1
2
0.0-4.0
4.1-8.0
8.1-12.0
12.1-16.0
16.1-20.0
20.1-24.0
24.1-28.0
28.1-32.0
32.1-36.0
36.1-40.0
>40.0
Standard length (cm)

Sandin 2003

- Fish assemblage depauperate in family level composition, density, and size.
- Island Biogeographic Theory predicts such for SMALL, REMOTE island
- Exploitation clearly part of the story


DIEU PRESENT
N° 37


OCT 30 2002


NOV 3 2002

- NO quantitative catch or effort data exists
- We made qualitative observations of catch and fishing activities
- Conducted informal interviews with three of the fishing boats present

Catch composition informally observed

TAXA		RELATIVE ABUNDANCE
Spiny Lobster	*Panulirus argus*	F
Hawksbill Turtle	*Eretmochelys imbricata*	F
Black Durgon	*Melichthys niger*	F
Yellow Stingray	*Urobatis jamaicensis*	F
Scrawled Filefish	*Aluterus scriptus*	F
Schoolmaster	*Lutjanus apodus*	F
Sand Tilefish	*Malacanthus plumieri*	F
Snapper sp.	*Lutjanus* sp.	F
Great Barracuda	*Sphyraena barracuda*	F
Squirrelfish	*Holocentrus sp.*	F
Queen Conch	*Strombas gigas*	M
Trunkfish	*Acanthostracion quadricornis*	M
Ocean Trigger	*Canthidermis sufflamen*	M
Surgeonfish sp.	*Acanthurus* sp.	M
Bar Jack	*Carangoides ruber*	M
Stoplight Parrot	*Sparisoma viride*	O
Queen Trigger	*Balistes vetula*	O
Atlantic Stingray	*Dasyatis sabina*	O
small sharks		O
Coney	*Cephalopholis fulvus*	O
Red Hind	*Epinephelus guttatus*	O

Changes from previous observations in Apr 2000

- Now use nets in addition to hook-and-line and traps
- Overall size of finfish reduced
- Novel capture of Hawksbill sea turtles and conch
  - conch are large - estimated 6-9 yrs of age (Glazer, pers. comm.)
  - total of 8 captured turtles observed (versus a total of ~ 10 live turtles observed in over 300 person-dives)

Apr 2000


Haiti
International boundary
Department boundary
National capital
Department capital
Railroad
Road
0 10 20 30 40 Kilometers
0 10 20 30 40 Miles
CUBA
Tortuga
NORTH ATLANTIC OCEAN
Windward Passage
Port-de-Paix
Môle Saint-Nicolas
Le Borgne
Cap-Haïtien
Montecristi
Baie-de-Henne
Les Trois Rivières
NORD-OUEST
Limbé
Fort-Liberté
Grande-Rivière-du-Nord
NORD
Dajabón
Saint-Raphaël
NORD-EST
Ennery
Gonaïves
Golfe de la Gonâve
ARTIBONITE
Rio Artibonito
Riviere Guayamouc
Lafond
Saint-Marc
Hinche
Caribbean Sea
Verrettes
Rivière Artibonite
CENTRE
Montrouis
Île de la Gonâve
Canal de Saint-Marc
Lac de Péligre
Elías Piña
Mirebalais
Anse à Galets
OUEST
Baie de Port-au-Prince
Manneville
DOMINICAN REPUBLIC
Canal du Sud
Grande Cayemite
Jérémie
Dame-Marie
Port-au-Prince
Lago Enriquillo
Pestel
Petit-Trou-de-Nippes
Croix-des-Bouquets
Léogâne
Pétionville
Jimani
Anse-d'Hainault
GRAND'ANSE
Petit-Goâve
Étang Saumâtre
Miragoâne
Kenscoff
Les Anglais
SUD
Trouin
Duvergé
Aquin
SUD-EST
Jacmel
Marigot
Belle-Anse
Les Cayes
Côtes-de-Fer
Bainet
Île à Vache
Port-Salut
Pedernales
Caribbean Sea
74
73
72
20
19
18
Base 801108 12-87

Human Component

- Methods
- Who are these fishermen
- Resource Use
- Policy Implications

Research Methods

- Ethnographic Assessment of fishing at Navassa takes place in Haiti.
- In-depth interviews with fishermen
- In-depth interviews with community members, especially family members of fishermen, community members involved with the non-fishing sector of the fisheries
- Oral Histories of the community and fishing
- Cultural Mapping of community
- Resource utilization maps – where do people fish.

Who are these fishermen

- Preliminary interviews suggest that these fishermen all come from the same community.
- In an effort to determine fishing pressure, we need to ascertain if this is true.
- If it is, it makes one question what local conditions, social, economic and/or environmental, make traveling to Navassa a viable option for this group of people as compared to others.
  - Are the reefs destroyed around their local community, and if so why
  - Are there species that are only found at Navassa and not locally, if so why
  - Is there a special connection to Navassa, cultural or religious (maroon society).

Resource Use

- History of fishing at Navassa, and in the community(ies)
- Changes in the fishery
- Current fishing strategies and species targeted
  - How often do they come
  - What gear do they use
  - What species do they target/prefer
- Why are they fishing
  - Small scale commercial production
  - Consumption
  - Occupational multiplicity? Do they do something else
- Distribution of catch
  - Sold locally, sold outside of community
  - Shared within family, social network, community

Policy Implications

- What is the amount of fishing effort
- Do these people have any informal management strategies
- Are they potential stewards of the resource
- Is it possible to create a system of co-management among Haiti, the US FWS and the fishermen.
- I s anyone adhering to fishing regulations, even if there are some in place (issues of enforcement and the reality of a regulation)
- Who else is fishing there? Are these fishermen the only one's applying effort to the area.

NOAA Technical Memorandum NMFS-SEFSC-501

STATUS OF REEF RESOURCES OF NAVASSA ISLAND: NOV 2002

EDITED BY

Margaret W. Miller

Navassa results will be incorporated into various other publications as Caribbean regional studies

Peer-reviewed publications to date:

-Miller MW, McClellan D, Begin C. (2004) Observations on fisheries activities at Navassa Island. Marine Fisheries Review (in press).

-Sandin SA, Miller MW, Vermeij MAJ (in review) Navassa Island: and isolated natural laboratory in the Carbbean Sea. Coral Reefs.